FHWA CREEK BRIDGE
Yellowstone Roads and Bridges
Spanning FHWA Creek on Northeast Entrance Road
Yellowstone National Park
Park County
Wyoming

HAER No. WY-38

HAER
WYO
15-YELNAP,
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BLACK & WHITE PHOTOGRAPHS

WRITTEN HISTORICAL & DESCRIPTIVE DATA

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Location: Spanning FHWA Creek on Northeast Entrance Road, 5.8 miles west of the Northeast Entrance Station, Yellowstone National Park, Park County, Wyoming
UTM: Abiathar Peak, WY, Quad. 12/573375/4979125

Date of Construction: 1936

Owner: Yellowstone National Park, National Park Service

Use: Vehicular bridge

Designer: E.T. Larson, Bureau of Public Roads

Builder: McLaughlin Construction Company, Livingston, Montana

Significance: FHWA Creek Bridge typifies the early design philosophy of the National Park Service, which was to use indigenous materials to harmonize man-made features with their natural surroundings. This philosophy is embodied in many of the park's Rustic Style buildings and structures.

Project Information: FHWA Creek Bridge is part of the Yellowstone Roads and Bridges Recording Project, conducted during the summer of 1989 by the Historic American Engineering Record, a division of the National Park Service, under the co-sponsorship of Yellowstone National Park, the NPS Roads and Bridges Program, and the NPS Rocky Mountain Regional Office, Denver. Historical research and written narrative by Mary Shivers Culpin, Historian, NPS Rocky Mountain Regional Office. Engineering description by Steven M. Varner, Virginia Polytechnic Institute. Edited and transmitted by Lola Bennett, HAER Historian, 1993.

DESIGN AND CONSTRUCTION OF FHWA CREEK BRIDGE

Construction of FHWA Creek Bridge was part of the reconstruction of the road from Tower Junction to Cooke City, in which winding alignment, steep grades, and ineffective drainage structures were to be corrected. The location survey, completed during the autumn of 1933 by A.O. Stinson of the Bureau of Public Roads, revealed that the drainage conditions on the east side of the creek presented a lesser problem "based on the fact that Baronett Peak, on the west side, is not only more precipitous, but stands considerably nearer the proposed road than Abiathar Peak, on the east. Consideration was also given the probability that the spring run-off from melting snow would be much more rapid and destructive from Baronett Peak, which is exposed to the sun."

Completed during the spring of 1934, the plans called for multi-plate arches with masonry headwalls but these plans were rejected after the National Park Service estimated the cost of a design that would meet their requirements. Instead new plans were drawn after a field inspection by the park officials and regional and district BPR officials. The new accepted designs for the project included single-span concrete bridges of simple design for three of the larger washes and concrete box culverts with masonry headwalls for the smaller drainages.

During the 1934-35 grading contract, channels were widened and deepened, and intercepting laterals and dikes were constructed at different points in order to confine the water to its present course. Because of frequent seasonal floods additional improvements to the channels were made. Another measure taken to prevent deposition of debris at the bridge site was channel excavation to a uniform gradient.

On June 19, 1936, the McLaughlin Company of Livingston, Montana was awarded the contract for the construction of the three bridges and three concrete box culverts. The contractor set up his temporary camp, several portable buildings of sheathing and tar paper, in a small open park between RWC Creek Bridge and FHWA Creek Bridge. All of the rations and supplies were purchased from the National Park Service at their warehouse at Mammoth Hot Springs. The crew began their project on July 2, 1936. A ⅝-yard dragline and a tractor with attached bulldozer were used in the structural excavation. However, rainy conditions caused the excavated area to be filled in with boulders and silt. Prior to the setting of the forms, all of the debris had to be removed by laborious and expensive hand labor. The rainy weather continued until the middle of September which caused problems in the forming and pouring of the substructure.

An approved two-bag mixer mixed the concrete which was then compacted in the forms by a mechanical vibrator. The concrete for the abutments was poured by tremies. After the concrete cured, two coats of Keramik stain were sprayed on the surface which produced a more uniform distribution of color than if the stain had been applied with hand brushes. The stain formula was an initial coat of a dilute solution (one pound per gallon) of medium brown and a second coat of green mixed in the proportion of two pounds per gallon of water. The appearance of the stain, which developed its color by chemical reaction, varied from structure to structure probably due to different atmospheric conditions or the length of time the concrete had been cured. The use of hand-sawn lumber caused the surface to appear crude and rough.

A crushing and screening plant at Cooke City produced the aggregate for the project. The same plant produced the aggregate for the recently completed Cooke City to Red Lodge, Montana road (Beartooth Highway). The cement came from Trident, Montana, the road oil from Laurel, Montana, and the reinforcing steel from St. Paul, Minnesota. During July the lodgepole pine logs for guard rail and posts were cut for curing. The logs were cut from a stand east of the TLF Creek Bridge site. The contractor placed and secured the guard rail posts to the forms prior to pouring the concrete curbs in order to achieve good alignment. In September a ⅝-yard Austin Badger shovel completed the channel improvements and the bridge approach fills. The borrow,

which was obtained from the channels, was hauled by two 1½-ton trucks.

The bridge, which was accepted on October 31, 1936, was completed in 124 days of approximately 83 percent of the allowable 150 days specified in the contract. The unskilled and intermediate labor pool came through the National Reemployment Office at Mammoth Hot Springs, with most of the men coming from Wyoming, Idaho and Montana. The unskilled laborer received the minimum wage of $.55 per hour with a few outstanding employees receiving raises above the minimum.[1]

DESCRIPTION

FHWA Creek Bridge is of one span with a maximum span length of 24' from center of support to center of support. The structure length is 27' from end of backwall to end of backwall. The deck width is 28' while the bridge roadway, curb-to-curb is 25' wide.[2] The slab of this bridge is reinforced with steel bars. The bars in the slab are all deformed with an allowable tension of 16,000 psi (a typical modern standard is 20,000 psi). The reinforcement itself is fairly typical even for a bridge of today. One-square-inch bars run longitudinally on the top and bottom at 4½-inch centers to take up the tension generated by moving loads on top of the slab. Transverse reinforcement consists of ⅝-inch diameter bars at 2-foot centers to distribute the loads laterally. The slab thickens at its edges for a slightly arched effect which also gives added concrete to take up the higher shear near the ends although no additional reinforcement is added to take up this shear. The concrete in the deck is class "D". The classification refers to the proportion of cement in the mix, with class "A" concrete having the highest proportion. The concrete has an allowable compression of 650 psi.[3] Nine inches of asphalt surfacing with a small superelevation of .01' per foot of width covers the deck. The grade on the bridge goes downhill 0.345 percent from south to north.

The abutments of FHWA Creek Bridge are flared U-shape. They spring from firm material. The 26'-long wing walls extend farther on the upstream side than on the downstream side where they are 16' long. The abutments have ½"-diameter horizontal reinforcing bars at 9-inch centers and ⅞"-diameter vertical reinforcing bars at 9-inch centers. The wing walls have ½-inch diameter longitudinal reinforcing bars at 18-inch centers. The wing walls also have vertical reinforcing which is concentrated towards the bridge and towards the base of the wing wall to take up the greater tension stress from the retaining wall bending moments found here. A typical range of vertical reinforcing in the wing walls is ¾"-diameter bars at 12-inch centers to 1"-diameter bars at 5½-inch centers. The footings of the wing walls have longitudinal and transverse reinforcement comparable with the spacing and size of the reinforcement in the wing walls. Again it is concentrated towards the bridge.[4]

The guard rail consists of 10"-diameter log posts 8'-6" on center. They rise 2'-4" above the curb and are sunk 1'-6" into an 8"-diameter log 1'-8" high. It is attached to the post on the roadway side by a ¾"-diameter bolt countersunk on the roadway side.

The estimated quantities of materials used in the bridge were as follows:

Class "A" concrete	227 cu. yds.
Class "D" concrete	48 cu. yds.
Reinforcing steel	31,000 lbs.
Excavation	630 cu. yds.

The total cost of the bridge was $10,201.50.[5]

In 1986, the general condition of the bridge was found to be poor with the exposed surfaces having from moderate to severe spalling.

ENDNOTES

1. L.C. Foreman, "Final Construction Report (1936) on Tower Junction--Cooke City Highway Project RTEC 8-A1, Small Bridges and Culverts, Yellowstone National Park, Wyoming," 29 March 1937.

2. "Bridge Inspection Report, Station 268+57 Bridge over FHWA Creek, August 10, 1986," U.S. Department of Transportation, Federal Highway Administration, Western Direct Federal Division.

3. Bridge at Station 268+57 Plans, Bureau of Public Roads, U.S. Department of Agriculture.

4. Ibid.

5. Ibid.